EXHIBIT 4

Exhibit 111

Request for *Ex Parte* Reexamination of U.S. Patent No. 7,636,309

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reexamination of: U.S. Patent No. 7,636,309 to Alicherry et al.	Reexam Control No.: To Be Assigned
Issued: December 22, 2009	Confirmation No.: To Be Assigned
Title: Multi-Path Routing Using Intra-Flow Splitting	Examiner: To Be Assigned
	Requester Docket No.: 94770-00023

Mail Stop **Ex Parte Reexam**
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF MARY K. BOLIN, Ph.D.
IN SUPPORT OF REQUEST FOR *EX PARTE* REEXAMINATION

I, Mary K. Bolin, declare as follows:

1.   I am Emeritus Professor at the University of Nebraska, Lincoln Libraries. I have held the following positions:

- Professor and Catalog and Metadata Librarian, Digital Initiatives and Special Collections Department, University of Nebraska—Lincoln Libraries (2015-2020);

- Professor and Chair, Discovery and Resource Management and Coordinator of Collection Development, University of Nebraska, Lincoln Libraries (2004-2015);

- Lecturer, San José State University School of Information: Lecturer, (2008-present);

- Head of the Technical Services Department, University of Idaho Library (1993-2003; promoted to Professor in 1999);

- Head of the Cataloging Department, University of Idaho Library (1986-1993; promoted to Associate Professor and tenured in 1991);

- Head of Records Maintenance Section, Cataloging Department, University of Georgia Libraries (1981-1986).

2.   Over the course of my work as a librarian, professor, researcher, student research supervisor, and author of numerous scholarly papers and other publications, I have had extensive experience with cataloging records and online

library management systems built around Machine-Readable Cataloging (MARC) standards. I also have substantial experience in authenticating printed documents and establishing the date when they were accessible to ordinarily skilled researchers.

3. Exhibit A is my full resume.

4. I have been retained by VMware Inc., Dell Technologies Inc., Dell Inc., and EMC Corporation (collectively "Requestors") to authenticate and establish the dates of public availability of certain documents in connection with Requestors' request for *ex parte* reexamination of U.S. Patent No. 7,636,309 (the "'309 patent," Ex. 101). For this service, I am being paid my usual hourly fee of $100 per hour.

Documents of Interest

5. The documents that are the subject of this declaration are the following:

1. ("Document 1"), Ex. 109; Crovella, M. E., & Bestavros, A. (1995). *Explaining world wide web traffic self-similarity.* Boston University Computer Science Department.

2. ("Document 2"), Ex. 104; Bertsekas, Dimitri, and Robert Gallager. *Data networks.* Prentice-Hall, 1987. Chapter 5, "Routing."

3. ("Document 3"), Ex. 105; Fodor, G., Malicskó, G., Pióro, M., & Szymanski, T. (2001). Path optimization for elastic traffic under fairness constraints. In *Teletraffic Science and Engineering* (Vol. 4, pp. 667-680). Elsevier.

4. ("Document 4"), Ex. 107; Gomes, D. G., Agoulmine, N., & de Souza, J. N. (2002, October). IP bandwidth allocation management using agents and neural network approach. In *IEEE Workshop on IP Operations and Management* (pp. 8-12). IEEE.

5. ("Document 5"), Ex. 106; Krishnan, R., & Silvester, J. (1993, May). An approach to path-splitting in multipath networks. In *Proceedings of ICC'93-IEEE International Conference on Communications* (Vol. 3, pp. 1353-1357). IEEE.

6. ("Document 6"), Ex. 108; Stathis, C., & Maglaris, B. (2000). Modelling the self-similar behaviour of network traffic. *Computer Networks*, *34*(1), 37-47.

7. ("Document 7"), Ex. 110; Seok, Yongho et al., *Fault-Tolerant Multipath Traffic Engineering for MPLS Networks*, Seoul National University, School of Computer Science and Engineering (January 2003).

Methodology

6.   I searched each of these documents in the OCLC database, Google Scholar, and one or more subscription databases such as IEEEXplore and ScienceDirect. I also searched the library catalogs of institutions such as the University of Nebraska—Lincoln and other large research libraries. My goal was to find a record in one of these databases that contained a date indicating when the book, article, or paper was available to the public.

available publicly before June 28, 2005 and could have been retrieved by a skilled researcher.

Authentication of Document 2 (Bertsekas)

31.   Document 2 has a MARC record in OCLC that was created September 11, 1991. The University of Nebraska—Lincoln Libraries added this book to its collection sometime after that and the volume received a barcode on March 25, 1999. The University of Iowa libraries own this book and the MARC record from their library catalog shows that it was added to their collection March 5, 1992

32.   Attachment 2-A is a PDF of the OCLC MARC record showing the creation date of September 11, 1991.

33.   Attachment 2-B is a PDF of the MARC record from the University of Nebraska—Lincoln Libraries catalog and a chat transcript that states that the item was barcoded on March 25, 1999.

34.   Attachment 2-C is a PDF of the MARC record from the University of Iowa library catalog, showing that the book was added to the collection on March 5, 1992.

Public Availability of Document 2 (Bertsekas)

35.   Based on the fact that this book has a MARC record in OCLC that was created on September 11, 1991, that the University of Nebraska—Lincoln

Libraries barcoded this book on March 25, 1999, and that the University of Iowa library added this book to their collection on March 5, 1992, Document 2 would have been available publicly before June 28, 2005 and could have been retrieved by a skilled researcher.

Authentication of Document 3 (Fodor)

36.   Document 3 was published in the journal *Teletraffic Science and Engineering* Volume 4, 2001, and is available in the Elsevier *ScienceDirect* database. Document 3 is cited in Michał Pióro, Gábor Malicskó, Gábor Fodor. "Optimal Link Capacity Dimensioning in Proportionally Fair Networks." In *NETWORKING 2002: Networking Technologies, Services, and Protocols; Performance of Computer and Communication Networks; Mobile and Wireless Communications*. In the series *Lecture Notes in Mathematics*, 2002. It is found in the SpringerLink database with an availability date of May 7, 2002, and the *Lecture Notes in Mathematics* volume is found in OCLC with a creation date of April 23, 2002. This volume is owned by the University of Chicago Libraries, and the MARC record in their catalog shows that it was added to their collection on June 1, 2003.

37.   Attachment 3-A is a PDF of the results page from Elsevier ScienceDirect showing Document 3.

38.   Attachment 3-B is a PDF of the results page from SpringerLink that shows the paper that cites Document 3.

- 13 -

39.   Attachment 3-C is a PDF of a paper from the SpringerLink database that cites Document 3.

40.   Attachment 3-D is a screenshot of the PDF properties of the paper that cites Document 3.

41.   Attachment 3-E is a PDF of the MARC record for the volume of *Lecture Notes in Mathematics* that contains the paper that cites Document 3.

42.   Attachment 3-F is a PDF of the MARC record of that volume from the catalog of the University of Chicago Libraries.

Public Availability of Document 3 (Fodor)

43.   Based on the fact that Document 3 was published in a journal available in ScienceDirect in 2001, that it is cited in a volume of *Lecture Notes in Mathematics* that was available in OCLC and SpringerLink in April and May, 2002, and that the *Lecture Notes* volume was added to the University of Chicago Libraries on June 1, 2003, Document 3 would have been available publicly before June 28, 2005 and could have been retrieved by a skilled researcher.

Authentication of Document 4 (Gomes)

44.   Document 4 is available in IEEE Xplore with an availability date of December 10, 2002. The PDF properties say that the document was created on July 31, 2001. Document 4 was published in *2002 IEEE Workshop on IP Operations and Management*. There is a MARC record in OCLC for that volume, with a creation

date of December 17, 2002. The catalog of the Linda Hall Library shows that this volume was added to the library on January 15, 2003.

45. Exhibit 4-A is the results screen from IEEE Xplore showing the December 10, 2002 availability date.

46. Exhibit 4-B is the PDF from IEEE Xplore.

47. Exhibit 4-C is a screenshot of the PDF properties showing a creation date of July 31, 2001.

48. Exhibit 4-D is the MARC record for the conference proceedings from OCLC with the creation date of December 17, 2002.

49. Exhibit 4-E is the MARC record from the Linda Hall Library for the conference proceedings with the creation date of January 15, 2003.

Public Availability of Document 4 (Gomes)

50. Based on the fact that Document 4 is available in IEEE Xplore with an availability date of December 10, 2002, and PDF properties showing a creation date of July 31, 2001, that there is a MARC record for the conference proceedings that was created in OCLC on December 17, 2002, and a MARC record from the catalog of the Linda Hall Library with a creation date of January 15, 2003, Document 4 would have been available publicly before June 28, 2005 and could have been retrieved by a skilled researcher.

Authentication of Document 5 (Krishnan)

51.   Document 5 is found in IEEE Xplore with an availability date of August 6, 2002. The PDF properties show a creation date of March 5, 2004. There is a MARC record for the conference proceedings in OCLC with a creation date of September 14, 1993.

52.   Exhibit 5-A is a PDF of the IEEE Xplore results screen for Document 5, showing the availability date of August 6, 2002.

53.   Exhibit 5-B is a PDF of Document 5 from IEEE Xplore.

54.   Exhibit 5-C is a screenshot of the PDF properties for Document 5, showing the creation date of March 5, 2004.

55.   Exhibit 5-D is a PDF of the MARC record from OCLC for the conference proceedings with a creation date of September 14, 1993.

Public Availability of Document 5 (Krishnan)

56.   Based on the fact that Document 5 is available in IEEE Xplore with an availability date of August 6, 2002, and PDF properties showing a creation date of March 5, 2004, and that a MARC record for the conference proceedings is found in OCLC with a creation date of September 14, 1993, Document 5 would have been available publicly before June 28, 2005 and could have been retrieved by a skilled researcher.

Authentication of Document 6 (Stathis)

69.   Exhibit 7-E is a PDF of the MARC record for the proceedings from OCLC, showing a creation date of May 7, 2004.
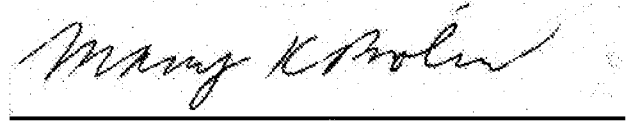
70.   Exhibit 7-F is a PDF of the MARC record of the proceedings from the UC Berkeley Libraries catalog, showing a cataloging date of December 1, 2004.

Public Availability of Document 7 (Seok)

71.   Based on the fact that a PDF of Document 7 is available on Penn State University's citeseerx site with a creation date of October 15, 2003, is listed in the conference proceedings for 2003 on the IASTED site, that the proceedings have a MARC record in OCLC with a creation date of May 7, 2004, and a MARC record in the UC Berkeley Libraries catalog with a cataloging date of December 1, 2004, it would have been publicly available before June 28, 2005 and could have been found by a skilled researcher.

72.   I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine, imprisonment, or both, under Section 1001 of Title 18 of the U.S. Code. I state under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

- 20 -

Executed on December 17, 2021:

_____

Mary K. Bolin

Exhibit 2-A

Declaration of Mary K. Bolin, Ph.D. In Support of Request for *Ex Parte* Reexamination

WorldCat: Data networks

OCLC 24501061	LDL Holdings - 373 other holdings
	1 LDL holding in GLIMIR cluster; 471 other holdings in GLIMIR cluster

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084         05.10 ‡2 bcl
084         53.70 ‡2 bcl
084         DAT 250f ‡2 stub
084         ST 200 ‡2 rvk
090
049         LDLL
100   1_    Bertsekas, Dimitri P.
245   10    Data networks / ‡c Dimitri Bertsekas, Robert Gallager.
250         2nd ed.
260         Englewood Cliffs, N.J. : ‡b Prentice Hall, ‡c ©1992.
300         xix, 556 pages : ‡b illustrations ; ‡c 24 cm
336         text ‡b txt ‡2 rdacontent
337         unmediated ‡b n ‡2 rdamedia
338         volume ‡b nc ‡2 rdacarrier
340         papier
504         Includes bibliographical references (pages 537-551) and index.
505   00    ‡t Introduction and layered network architecture -- ‡t Point-to-point protocols and links -- ‡t Delay
            models in data networks -- ‡t Multiaccess communication -- ‡t Routing in data networks -- ‡t Flow
            control.
650   _0    Data transmission systems.
650   _6    Données ‡x Transmission. ‡0 (CaQQLa)201-0003631
650   _6    Téléinformatique. ‡0 (CaQQLa)201-0092323
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650   _7    Redes e sistemas de informacao. ‡2 larpcal
650   _7    Data transmission systems. ‡2 nli
650   _7    Computer networks. ‡2 nli
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653	_0	Data transmission systems
700	1_	Gallager, Robert G.
776	08	‡i Online version: ‡a Bertsekas, Dimitri P. ‡t Data networks. ‡b 2nd ed. ‡d Englewood Cliffs, N.J. : Prentice Hall, ©1992 ‡w (OCoLC)555536490
856	41	‡3 Table of contents ‡u http://www.gbv.de/dms/bowker/toc/9780132009164.pdf
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Exhibit 3-A

Declaration of Mary K. Bolin, Ph.D. In Support of Request for *Ex Parte* Reexamination

ScienceDirect

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Path optimization for elastic traffic under fairness constraints

Gábor Fodor [1] ✉, Gábor Malicskó [2] ✉, Michał Pióro [3, 4] ✉, Tomasz Szymanski [4] ✉

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We study optimal path selection and bandwidth allocation algorithms for elastic flows under fairness constraints. We assume that traffic demands between origin-destination (O-D) pairs are given and are characterized by a minimum and a maximum bandwidth requirement. We consider the case when between each O-D pair there is a set of admissible paths through which the flows realizing the demand may be routed. (We say that a set of flows realizes a demand associated with an O-D pair, if the sum of the allocated bandwidths of these flows is at least this demand.) The allocation task is thus not only to determine the bandwidth of each flow realizing the demands, but also to identify the specific path for each demand such that a fairness specific utility is maximized. In the max-min fairness case this implies the maximization of the minimum allocated bandwidth, whereas in the proportional fairness case it implies the maximization of a logarithmic utility function. As an interesting (and practically relevant) generalization, we also allow multiple paths to realize a given demand (demand-split). We propose algorithms that solve the respective optimization tasks associated with the popular max-min and proportional fair sharing constraints. We demonstrate the efficiency and usefulness of these algorithms through numerical examples based on the backbone Polish public network. We believe that the results can be used in traffic engineering of networks carrying elastic traffic.

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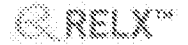
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FEEDBACK

Exhibit 5-A

Declaration of Mary K. Bolin, Ph.D. In Support of Request for *Ex Parte* Reexamination

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An approach to path-splitting in multipath networks

Publisher: IEEE   [Cite This]   📄 PDF

R. Krishnan ; J. Silvester   All Authors

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IEEE Transactions on Wireless Communications
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Abstract:
It is proposed that a single connection at the transport layer be implemented as multiple source routes in the network layer, resulting in a balanced loading of network resources. The paths are not necessarily of equal length. The problem of traffic bifurcation at the source, which achieves path splitting, is solved by computing the flows on all the links in the network to minimize a given objective function, such as average delay or packet loss probability. The use of the Join-Biased Queue (JBQ) rule to effect the required traffic splitting is proposed. The superiority of the JBQ rule over other schemes is demonstrated. It is shown that the values obtained for the flows depend on the objective function being optimized. A bound on the size of the destination resequencing buffer necessary for packets that are received out of order, is computed. < >

📄 PDF

Published in: Proceedings of ICC 93 - IEEE International Conference on Communications

Date of Conference: 23-26 May 1993

Date Added to IEEE Xplore: 06 August 2002

Print ISBN:0-7803-0950-2

INSPEC Accession Number: 4372559

DOI: 10.1109/ICC.1993.397509

Publisher: IEEE

Conference Location: Geneva, Switzerland

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